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(21) International Application Number: PCT/IT96/00210 (22) International Filing Date: 13 November 1996 (13.11.96) (30) Priority Data: VR95A000092 16 November 1995 (16.11.95) IT (71) Applicant (for all designated States except US): AL.CHI.MI.A. S.R.L. [IT/IT]; Via G. Barbarigo, 9, I-35020 Albignasego (IT). (72) Inventors; and (75) Inventors/Applicants (for US only): SCESA, Carla [IT/IT]; Via Della Cammilluccia, 741, I-00135 Roma (IT). CALDERINI, Gabriella [IT/IT]; Via IV Novembre, 61, I-35020 Due Carrare (IT). (74) Agent: LANZONI, Luciano; Bugnion S.p.A., Via Pelliccerie, 2, I-33100 Udine (IT).		(81) Designated States: CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: COSMETIC FORMULATIONS CONTAINING BALANCED MIXTURES OF NATURAL-ORIGIN ANIONIC POLYMERS AND PROCESS FOR TOPICAL APPLICATION OF SAME		
(57) Abstract <p>Cosmetic formulations containing balanced mixtures of natural-origin anionic polymers, made up of a gel material consisting of a balanced mixture of anionic polysaccharides of natural origin containing 0.1 % to 5 % of a soluble alginate, 0.01 % to 0.5 % of agar, 0.01 % to 0.5 % of pectin and 0.05 % to 1 % of xanthan gum, the balance being water. The process for topical application of the gel material comprises the following operating steps: spreading a polysaccharide matrix of said gel material over a plate; levelling said polysaccharide matrix to a homogeneous layer of predetermined thickness; dipping said plate into a 1 % calcium salt solution for about 5 minutes; subsequently dipping said plate into a 2 % calcium salt solution for about 2 minutes; thereby obtaining a structured gel provided with a physical pattern of its own; separating said structured gel from said plate; subsequently washing said structured gel in distilled water.</p>		

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Description.

Cosmetic formulations containing balanced mixtures of natural-origin anionic polymers and process for topical application of same.

Technical Field.

The invention relates to cosmetic formulations containing balanced mixtures of natural-origin anionic polymers and the process for topical application of same. More particularly, topical preparations are concerned which
05 have defined features and contain balanced mixtures of anionic polysaccharides of natural origin.

Background Art.

The physicochemical properties of the used polymers give
10 the preparations the possibility of taking defined and structurally different physical patterns, in addition to a clear moisturizing and film-forming power, thereby extending the application possibilities of same above all in the field of the skin and scalp physiology. In particular,
15 preparations can be in the form of a classic viscoelastic gel which however is capable of, upon appropriate treatments, converting in situ into a film of easy removal from the skin at the end of the treatment period, or they can at once exhibit a defined and structured
20 physical pattern, while keeping the moisturizing and film-forming properties of the starting gel (a gel structured in the form of a membrane) unchanged. The polymers of natural origin relating to the present invention are some anionic polysaccharides that have been already widely used
25 in the cosmetic, pharmaceutical and foodstuff field to an industrial level. In accordance with the known art, they are pectin, alginates, xanthan gum and agar.

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Pectin.

It is a natural polymer consisting of many molecules of galacturonic acid bonded to each other by B1-4 glucoside bonds; its molecular weight may even be higher than 200000. Based on the esterification degree of the galacturonic acid with methyl groups, pectins separate into pectic acid (containing a low percentage of methoxyls) and pectinic acid (containing a high percentage of methoxyls). Both moieties are present in kind as essential constituents of the vegetable cell walls. These anionic polysaccharides dissolve in water at high temperatures giving origin to solutions that subsequently, when cooled in an acidic medium, form a gel. Pectin moieties have found wide use in the foodstuff field where they are utilized to give consistency to jams, ice-creams, puddings, whereas in the cosmetic technology these polysaccharides are mainly employed as rheologic modifiers.

Alginates.

The alginic acid is a natural polymer of a gelatin-like appearance which is present in different species of brown marine algae. From a chemical point of view it is a polyuronic acid consisting of D-mannuronic acid and L-guluronic acid bonded to each other by B1-4 glycoside bonds. The molecular weight of the natural polymer may vary between 30000 and 200000, depending on the polymerization degree of same. Salification and esterification of the molecule leads to production of alginates. The alginic acid is not very soluble in water, in contrast with most alginates (sodium, potassium, ammonium and propylene glycol ones), which are very hydrophilic and possess strong colloidal properties; other alginates, on the contrary, such as calcium alginate, have tendency to precipitate giving origin to products having

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well defined physical properties. The alginic acid and the soluble alginates are widely used as thickeners in the foodstuff field and as rheologic modifiers and stabilizers in the cosmetic field. These chemical compounds are also used as additives in the pharmaceutical industry, whereas salts and insoluble derivatives thereof have found wide application possibilities in the field of biomaterials, above all in the field of tissue regeneration.

Xanthan gum.

It is a high-molecular-weight (beyond one million) natural polysaccharide produced by means of a fermentation process of glucose with microorganism Xanthomonas campestris. In the xanthan gum there is present mannose, glucose and glucuronic acid (also present as sodium, calcium and potassium salt), as the main monosaccharides. This polymer, in contact with water, forms highly viscous solutions which are affected to a low degree by pH and the presence of salts. The xanthan gum is employed in the cosmetic and foodstuff field mainly as a viscosity-increasing and suspension-promoting agent.

Agar.

It is a complex polysaccharide extracted from thallus of many red algae and consists of two different polysaccharide chains: agarose and agarpectin. The fundamental feature of this polymer is that of forming, already at low concentrations, water solutions capable of gelling at relatively low temperatures and keeping this form at high temperatures as well. It is used in the cosmetic industry as a thickener and in microbiology as a culture medium.

From the above it is apparent that the polymers utilized in the preparations being the object of the present invention have been already widely used individually in the industrial field of interest.

As regards in particular preparations of a structured

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physical pattern, although in literature there are already patent references relating to a highly hydrated gel in the form of a self-supporting film (patent application EP No. 91108656.9), to a hydrogel in the form of a membrane made up of hydrophilic biopolymers (patent application EP No. 83301149.7) and to a gel that by drying forms a protective film adhering to the skin (US patent No. 4393048), however these preparations have chemical compositions and features different from those herein described and are addressed to a merely medical use, as they are concerned with the field of injury dressing and tissue regeneration.

Disclosure of the Invention.

The essential object of the present invention is therefore to obviate the restrictions of the known art by providing formulations in which the different natural polymers are combined with each other in a balanced manner so as to obtain topical preparations having physical properties different from those achievable with the individual components.

The foregoing and still other objects are all achieved by the cosmetic formulations containing balanced mixtures of natural-origin anionic polymers, the main features of which are set forth in the appended claims.

Another object of the present invention is to provide a process for topical application of these cosmetic formulations.

The main features of said process are illustrated in the appended claims.

Further features and advantages of the present invention will be best understood from the following detailed description.

The cosmetic preparations being the object of the invention contain an amount included between 0.1% and 5% (by weight) of a soluble alginate, preferably 3% of sodium

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alginate; an amount included between 0.1% and 0.5% of agar, preferably 0.05%; an amount included between 0.01% and 0.5% of pectin, preferably 0.1% of pectic acid (moiety of defined molecular weight); an amount of xanthan gum included between 0.05% and 1%, preferably 0.15%; the balance consisting of water. During this step the preparation appears like a viscoelastic hydrogel material characterized by its own rheologic profile, different from that of its components taken individually; the gel material is provided with a high moisturizing and film-forming power and it can be used as such or improved by means of the following three different procedures.

1. The gel material can be optionally enriched with different water-soluble and/or water-dispersible active ingredients, such as for example protein hydrolysates (up to 5% by volume), glycolic vegetable extracts (up to 1% by volume), hydroalcoholic fluid essences (up to 1% by weight), inorganic powders (up to 1%) or metabolic activators such as for example vitamins. Incorporation of the functional substances takes place more easily if the active ingredients are added during the matrix preparation step. Salicylic acid to the concentrations afforded by law is utilized as the preserving agent. These preparations have the characteristic that they can be removed from skin using two different modalities: (a) by a mere compress of calcium chloride, executed after spreading, by local application of soaked gauze pads. By this method, at the end of treatment, the preparation will have a rigid structure well adhering to gauzes and removable in the form of a skin imprint mold. Thus, a mechanical peeling effect is obtained; (b) by a wet sponge or mere rinsing.

2. The gel material can be submitted to a working process resulting in a rigid gel of a structure having a defined physical pattern. This process involves spreading of a gel layer of a thickness of 0.3 to 1.5 mm, preferably 0.6 mm,

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on a rigid glass or Plexiglas structure the sizes of which are 25 cm x 30 cm, provided with thickness regulators, and submitting the assembly to a bath of a duration of 3 to 10 minutes in a solution containing calcium ions and/or other
05 mono-bi-trivalent ions to a concentration included between 1% and 10%. In the presence of calcium ions, the starting gel undergoes a coagulation process with formation of a structured gel material, of easy handling and well adaptable to the skin surface. Under this physical pattern
10 the gel material can still incorporate active ingredients, provided they are water-soluble; in this case the structured gel is submitted to further baths of a duration of 3 to 10 minutes, in solutions containing the substances intended for incorporation. The nonionic chemical
15 compounds are incorporated quickly, due to the concentration gradient which is formed between the gel water and the bath solution, whereas the ionic substances are incorporated somewhat more slowly due to an exchange phenomenon between the Na^{++} of the alginate and the cation
20 of the ionic compound. In this manner gels can therefore be enriched with protein hydrolisates, alphahydroxyacids and hydroalcoholic fluid essences.

3. The gel material can be submitted to the physical-structuring process described in the preceding paragraph, even after it has been enriched with the functional
25 substances described in paragraph 1.

After having illustrated the three different gel-preparation procedures, for illustrative purposes alone and not in a limiting sense some examples of preparations
30 containing balanced mixtures of anionic polysaccharides of natural origin obtained in accordance with the modalities described above are set forth hereinafter.

Example 1.

1.5 g of agar is dispersed in 100 ml of distilled water
35 bringing the solution to the boiling point in a microwave

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oven; after cooling, 33.3 ml of this solution is transferred into one litre of distilled water. Then 2 g of salicylic acid is added and is dissolved bringing the solution to 40°C over a period of 5 to 10 minutes. Next, addition of the other preserving agents takes place, in this case Kathon CG at a final concentration of 0.05%. Meanwhile, a powder mixture containing 30 g of sodium alginate, 1.5 g of xanthan gum and 1.0 g of pectic acid is prepared. This polysaccharide mixture is gradually added to the previously prepared solution under strong stirring. During this step, stirring needs to be reduced each time the solution shows a too quick thickening phenomenon, so as to let polymers hydrate a while; then stirring is started again until the gel material appears to be homogeneous. At this point the preparation is submitted to an outgassing process by centrifugation.

Example 2.

30 to 40 ml of a gel prepared following the modalities described in Example 1 is taken out and laid on a Plexiglas plate (25 cm by 30 cm) having a thickness of 0.6 mm at the edges. The polysaccharide matrix is spread over the plate using an appropriate leveling device, made of Plexiglas as well, so as to form a homogeneous layer of the desired thickness. When all the excess material has been carefully removed, the whole plate is dipped first into a 1% calcium chloride solution for 5 minutes and subsequently into a 2% calcium chloride solution for 2 minutes. At the end of the second bath, the starting matrix has been converted to a structured gel provided with its own physical pattern. Once separated from the precipitation plate, the product is washed by immersion into distilled water and preserved in a 0.2% salicylic acid solution.

Example 3.

The same procedure as in Example 1 is followed, with the

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exception that, before adding the balanced polysaccharide mixture, 50 ml of collagen hydrolisate or 50 ml of elastin hydrolisate or 50 ml of a mixture of two proteic hydrolisates is added. After the outgassing process, the preparation can then be optionally submitted to the physical structuring process described in Example 2.

Example 4.

The same procedure as in Example 1 is followed, except the following. Before addition of the balanced polysaccharide mixture, 10 ml of glycolic vegetable extract from rosemary, or witch hazel, or sage, or 10 g of fluid hydroalcoholic essence from camomile, witch hazel or liquorice is added. After the outgassing process, the preparation can be optionally submitted to the physical structuring process 35described in Example 2.

Example 5.

The same procedure as in Example 1 is followed, with the exception that, before addition of the balanced polysaccharide mixture, 10 g of clay or zinc oxide is added. After the outgassing process, the preparation can be optionally submitted to the physical structuring process described in Example 2.

Example 6.

The same procedure as in Example 1 is followed, with the exception that, before addition of the balanced polysaccharide mixture, 5 g of pantothenate or nicotinic acid or vitamin B₆ is added. After the outgassing process, the preparation may then be optionally submitted to the physical structuring process described in Example 2.

Example 7.

The same procedure as in Example 1 is followed, with the exception that, before addition of the balanced polysaccharide mixture, 10 ml of glycolic vegetable extract from witch hazel and 50 ml of proteic hydrolisate of elastin are added. After the outgassing process, the

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preparation may be optionally submitted to the physical structuring process described in Example 2.

Example 8.

05 The structured gel prepared according to the process described in Example 2, after washing in water, is dipped into a bath containing up to 10% either of lactic acid or of glycolic, malic or tartaric acid. After the incorporation process the structured gel is maintained in sealed single-dose packages.

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Claims

- 05 1. Cosmetic formulations containing balanced mixtures of anionic polymers of natural origin, characterized in that they are made up of a gel material consisting of a balanced mixture of anionic polysaccharides of natural origin containing 0.1% to 5% of a soluble alginate, 0.01% to 0,5% of agar, 0.01% to 0.5% of pectin and 0.05% to 1% of xanthan gum, the balance consisting of water.
- 10 2. Cosmetic formulations according to claim 1, characterized in that said gel material contains up to 5% by volume of proteic hydrolisates.
- 15 3. Cosmetic formulations according to claim 1, characterized in that said gel material contains up to 1% by volume of glycolic vegetable extracts and up to 1% by weight of fluid hydroalcoholic essences.
- 20 4. Cosmetic formulations according to claim 1, characterized in that said gel material contains inorganic powders.
- 25 5. Cosmetic formulations according to claim 1, characterized in that said gel material contains water-soluble vitamins intended as metabolic skin activators.
- 30 6. Cosmetic formulations according to claim 1, characterized in that said gel material contains both proteic hydrolisates and glycolic vegetable extracts.
7. A process for topical application of the gel material as claimed in claim 1, characterized in that it comprises the following operating steps:

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- spreading a polysaccharide matrix of said gel over a plate;
 - levelling said polysaccharide matrix to a homogeneous layer of predetermined thickness;
 - 05 - dipping said plate into a 1% calcium chloride solution for about 5 minutes;
 - subsequently dipping said plate into a 2% calcium chloride solution for about 2 minutes;
 - thereby obtaining a structured gel provided with a
 - 10 physical pattern of its own;
 - separating said structured gel from said plate;
 - subsequently washing said structured gel in distilled water.
- 15 8. A process according to claim 7, characterized in that it comprises the further operating step of:
- keeping said structured gel in a 0.2% salicylic acid solution.
- 20 9. Cosmetic formulations according to claims 1 and 7, characterized in that said gel material is a structured gel having a physical pattern of its own.
- 25 10. Cosmetic formulations according to claims 1 and 7, characterized in that said structured gel having a physical pattern of its own contains up to 10% of alphas-hydroxyacids.
- 30 11. Cosmetic formulations according to claims 1 and 7, characterized in that said structured gel contains up to 5% by volume of proteic hydrolysates.
- 35 12. Cosmetic formulations according to claims 1 and 7, characterized in that said structured gel contains up to 1% by volume of glycolic vegetable extracts and up to 1%

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by weight of fluid hydroalcoholic essences.

05 13. Cosmetic formulations according to claims 1 and 7,
characterized in that said structured gel contains
inorganic powders.

10 14. Cosmetic formulations according to claims 1 and 7,
characterized in that said structured gel contains water-
soluble vitamins intended as metabolic skin activators.

15 15. Cosmetic formulations according to claims 1 and 7,
characterized in that said structured gel contains both
proteic hydrolisates and glycolic vegetable extracts.

20 16. Cosmetic formulations containing balanced mixtures of
natural-origin anionic polymers and process for topical
application of same according to the preceding claims and
as hereinbefore described, for the intended purposes.

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/IT 96/00210

A. CLASSIFICATION OF SUBJECT MATTER

A 61 K 7/48

According to International Patent Classification (IPC) or to both national classification and IPC⁶

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A 61 K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR, A, 1 484 809 (M.M. CONTIER) 16 June 1967 (16.06.67), the whole document. --	1-16
A	FR, A, 2 382 891 (J. FLORENT) 06 October 1978 (06.10.78), the whole document. --	1-16
A	US, A, 5 194 253 (R. GARRIDO) 16 March 1993 (16.03.93), the whole document. --	1-16
A	EP, A, 0 045 493 (SYNTEX) 10 February 1982 (10.02.82), claims.	1-16

☒ Further documents are listed in the continuation of box C.☐ Patent family members are listed in annex.

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Date of the actual completion of the international search
12 March 1997

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

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International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p style="text-align: center;">--</p> US, A, 5 139 771 (T. GERSTEIN) 18 August 1992 (18.08.92), the whole document. <p style="text-align: center;">----</p>	<p>1-6, 9-16</p>

ANHANG

zum internationalen Recherchen-
bericht über die internationale
Patentanmeldung Nr.

ANNEX

to the International Search
Report to the International Patent
Application No.

ANNEXE

au rapport de recherche inter-
national relatif à la demande de brevet
international n°

PCT/IT 96/00210 SAE 148806

In diesem Anhang sind die Mitglieder
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angeführten Patentdokumente angegeben.
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This Annex lists the patent family
members relating to the patent documents
cited in the above-mentioned inter-
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Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche		Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
FR A	1484809		keine - none - rien	
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US A	5194253	16-03-93	EP B1 386216 AT E 106433 AU A1 42121/89 AU B2 6332289 DE C0 68915737 DE T2 68915737 DK A0 1137/90 DK A 1137/90 EP A1 386216 ES AF 2016159 FI A0 903210 FR A1 2636339 FR B1 2636339 GR A 89100564 JP T2 3505889 ND A 902010 ND A0 902010 PT A 91677 PT B 91677 WD A1 9002774 ZA A 8906836	01-06-94 15-06-94 02-04-90 24-12-92 07-07-94 12-01-95 08-05-90 26-06-90 12-09-90 16-10-90 08-05-90 16-06-90 17-07-92 31-10-90 19-12-91 07-05-90 07-05-90 30-03-90 31-05-95 23-04-90 27-06-90
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